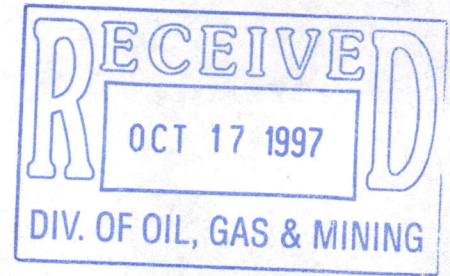


m/045/017



**GOLDEN GATE BASIN POST-CLOSURE  
SURFACE WATER MONITORING  
BARRICK RESOURCES (USA) – MERCUR MINE**

October 4, 1997

Prepared by:

**Global Environmental Technologies, L.L.C.**  
Salt Lake City, Utah

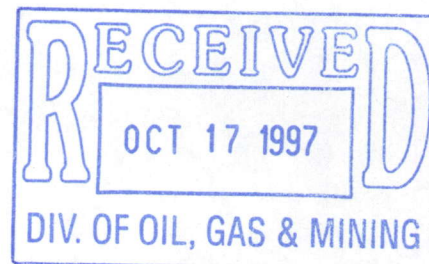


M1045/017

BARRICK RESOURCES (USA) INC. Tel: (801) 268-4447  
Barrick Mercur Gold Mine Fax: (801) 266-4296  
P.O. Box 838  
Tooele, Utah 84074-0838

October 14, 1997

Mr. Don A. Ostler, P.E.  
Executive Secretary  
Division of Water Quality  
Department of Environmental Quality  
288 North 1460 West  
Salt Lake City, UT 84114-4870



Dear Mr. Ostler:

**Subject: Golden Gate Basin, Surface Water Runoff Monitoring**

Attached, please find a report entitled "Golden Gate Basin Post-Closure Surface Water Monitoring" prepared for Barrick Mercur Mine by Global Environmental Technologies, LLC of Salt Lake City, Utah. The report presents:

- Runoff water quality data collected to date.
- The reclamation plan for the Golden Gate Pit (Golden Gate Basin).
- Provides a plan for future water quality monitoring.
- provides a regulatory basis for exemption from a groundwater quality discharge permit for this facility.

Based on this report, and discussions during meetings held between Barrick and the DWQ in January and June 1997, Barrick is requesting Division approval, to allow all area runoff to proceed into the Golden Gate Basin.

Barrick would appreciate the Division's timely review and approval, to allow for construction of drainage structures to begin as the winter weather allows. Please contact me at extension 335 should you have any questions concerning the enclosed report.

Respectfully,

A handwritten signature in cursive script that reads 'David P. Beatty'.

David P. Beatty  
Environmental/Occupational Health Coordinator

cc: C. L. Olsen  
G. M. Eurick  
S. D. Davis  
M. A. Wright (UDOGM)  
D. Frederick (UDWQ)  
J. S. Brown (GET)

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## Appendix A – Water Quality Analytical Reports

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## 1.0 INTRODUCTION

Barrick Resources (USA), Inc. (Barrick) retained TriTechnics and Global Environmental Technologies to prepare a plan to evaluate potential impacts to surface water originating from post-reclamation mine drainage runoff into the Golden Gate Basin (GGB). The basin is a former mining pit. Barrick plans to use the GGB as a catch basin to collect surface water runoff conveyed from the reclaimed mine area. The use of the GGB to collect surface runoff will minimize the potential for mine drainage to run offsite. The GGB is located in the central portion of the Mercur Canyon at the junction with Reservation Canyon and Meadow Canyon, shown on Figure 1-1.

GGB inflow water quality issues were discussed in a meeting between Barrick, TriTechnics and the Utah Division of Water Quality (UDWQ) on January 29, 1997. During the meeting, issues of concern identified by the UDWQ included the amount of available runoff into the GGB, quality of waters which could potentially impound in the basin and potential impacts that these waters may have to surface and ground water. The UDWQ requested that Barrick collect representative runoff water quality samples from reclaimed and revegetated areas that contribute recharge into the GGB. As a result of that meeting, water quality data were collected and presented to the UDWQ in a subsequent meeting on June 4, 1997. During the June 4 meeting, the UDWQ indicated that a ground water discharge permit would not be required for the GGB because the facility would be considered to be permitted by rule and not required to obtain a discharge permit. However, the UDWQ requested a plan to collect runoff data and to prepare an evaluation report documenting runoff water quality to support Barrick's position that a discharge permit will not be required.

The purpose of this report is to:

- Provide a presentation of the runoff water quality data collected to date;
- Describe proposed GGB backfill reclamation plan, and revegetation specifications for the GGB and surrounding reclaimed areas;

- Provide an approach for the format of annual reports on water ponding (if present) and water quality performance;
- Present a plan for surface water flow and water quality monitoring provisions of inflow from meteoric sources in the future;
- Provide a regulatory basis for requesting the UDWQ for an exemption of the GGB from a Ground Water Quality Discharge Permit.

## 2.0 BACKGROUND

### 2.1 Geology

The GGB is located on an upper thrust plate of the Manning Canyon Thrust in Mercur Canyon. Formation strike is northwesterly. Rocks dip northeasterly, generally between 20 to 30 degrees. As a result of the geologic setting, the geologic formations exposed in the GGB are highly fractured. Rocks exposed on the side walls are comprised predominantly of limestones, with lesser amounts of siltstones. Gold-bearing ore deposits were found in the limestone-hosted oxide ore, which lacks sulfide mineralization. The ore has been removed, and the remaining overburden rock surrounding the GGB is also lacking in sulfide mineralization.

A thin layer of Long Trail Shale (LTS) outcrops at the surface and is exposed on the sidewalls of the GGB. The LTS contains limited zones of primary pyrite mineralization that has a slight potential for acid generation.

### 2.2 Hydrogeology

Ground water in the Mercur Canyon area, where present, is found to be perched on the Long Trail Shale (LTS), and flows in an eastward direction (down dip) towards the Pole Canyon Syncline. The LTS has low hydraulic conductivity (ranging from about 15 to 300 feet per year in Mercur wells). The LTS has limited exposure on the GGB sidewalls. However, the basal contact of the LTS is exposed just to the west of the GGB and there is little area available for recharge to the GGB. No water flows into the GGB, and it is currently dry. The bottom of the GGB exposes limestones (Mercur Beds), which contained oxide gold-bearing ores. Deep drilling in the GGB area prior to mining activity indicated no occurrences of water to a depth of 2,050 feet.



### 3.0 SURFACE WATER

#### 3.1 Surface Water Runoff

Mercur Canyon drains westward towards Rush Valley. Presently, surface water does not run off the mine site. The combined effects of low precipitation (about 19 inches per year) and high evaporation rates limit the amount of runoff available to the Mercur Canyon drainage. Sediment ponds also restrict runoff from the site. As a result of the fractured nature of the bedrock in Mercur Canyon drainage, the rate of surface water infiltration is high. Historic flows in the Mercur Canyon drainage are indicated to be less than 200 cubic feet per second, based on measurement of the existing stream channel.

##### 3.1.1 Runoff Potential

Surface water runoff potential for the Mercur Canyon drainage was estimated over an area of 6170 acres from 14 contributing sub-basin drainages. Sub-basin areas and areas of mining disturbances were provided by JBR (June 1996). Each of the sub-basin drainages was further subdivided into disturbed and undisturbed areas. A runoff curve number of 65 was applied to undisturbed areas and a runoff curve number of 86 was used for disturbed areas. Runoff was calculated for 2 cases; the 10 year 24-hour and the 100 year 24-hour storm events. Calculated runoff volumes are shown on Tables 3-1 and 3-2 for each event, respectively. Precipitation amounts are based on site specific correction factors from the NOAA-2 Atlas, Tooele Weather Station and from JBR (June, 1996).

#### 3.2 Reclamation and Ponding Potential

To date, no water has ponded in the GGB. The GGB is presently being backfilled with 20 to 40 feet of native limestone. Canyon slopes above the GGB will be topsoiled with pre-stripped soil and reseeded with the seed mix shown on Table 3-3. Increased

vegetation will result in a decreasing amount of runoff and improved runoff water quality.

Conservative estimates of runoff for significant storm events are calculated on Tables 3-1 and 3-2. Estimated runoff volumes (10 to 20 million ft<sup>3</sup>) from the 10 and 100 year storm events could potentially fill the GGB to about 50 feet above the basin floor. However, this volume assumes no infiltration of runoff through the floor of the basin or through channels leading to the GGB. Fractured geological conditions in the limestone will promote increased infiltration through the basin floor. To date, no water has been noted to pond in the GGB during excavation, mining, or backfilling operations.

### 3.3 Water Quality

Surface water runoff was sampled on three occasions during February and March 1997. Runoff was sampled from the drill and blast yard ramp and from the east and southwest ramps into the GGB. Runoff was collected during snowmelt from the unreclaimed ramp areas because no runoff samples were available from revegetated areas. Table 3-4 presents the results of sampling events. Water quality is slightly alkaline (pH of 7.4 to 8.1) and TDS ranges from 648 to 824 mg/l. Levels of arsenic, mercury and thallium are slightly elevated because runoff has contacted disturbed areas and historic mining tailings that have not been removed for processing as of the sample date. Once reclamation has been completed, it is anticipated that runoff volume will be decreased, and runoff that is available to the GGB will improve in quality.

## 4.0 SURFACE WATER SAMPLING PLAN

### 4.1 Runoff Sampling

Barrick intends to implement a sampling plan to monitor water quality flowing into the GGB and submit annual reports documenting the analytical results to the UDWQ. Surface water quality sample collection and analysis will be performed in accordance with Appendix A, Water Quality Monitoring Quality Assurance (QA) and Quality Control (QC) Plan for Ground Water Quality Discharge Permits UGW450001 and UGW450002, dated July 1995. Samples will be analyzed for parameters, shown in Table 4-1, which is consistent with UPDES analyses. In addition, measurements of pH, temperature, specific conductance and total dissolved solids will be measured and recorded in the field. Results will be summarized and presented in a water quality report to the UDWQ following December of each year during post-closure monitoring, consistent with the effective periods of the UPDES permit and related Stormwater Pollution Prevention Plan (SWPPP) requirements.

Runoff samples will be collected from channel diversions to be constructed into the GGB to reduce the potential for erosion of the sidewalls. Diversion sampling points will be located on a map of the facility and labeled as to location. Channel diversions will conduct surface drainage runoff from conveyances surrounding the facility. As a result of the limited amount of runoff available in the Mercur Canyon, sampling at the diversion point(s) will only be performed following snowmelt events and storm events greater than 1.0 inches consistent with the SWPPP. Where possible, a grab sample will be collected to provide water quality data from the initial runoff period during a storm or snowmelt event, or during the first 30 minutes of the event where possible. Flow-weighted composite samples may not be practical as a result of the anticipated limited inflows into the GGB, but may be collected at Barrick's option where flows of longer durations are anticipated, such as during snowmelt.

#### 4.2 Surface Water Sampling

Barrick will collect a representative grab sample of accumulated waters from the GGB if significant quantities (in excess of 5-foot depth) exist. GGB waters will be analyzed for parameters shown on Table 4-1. A staff gauge or measuring device capable of monitoring and recording water depth will be placed in the bottom of the GGB and surveyed. The purpose of the gauge will be to measure any ponding in the GGB. Following significant storm events (in excess of 1.0 inches), the GGB will be observed for ponding or runoff. A monthly log will be kept to record any ponding observations or lack of water. This log of observations will be included in the annual report to the UDWQ.

## 5.0 SUMMARY

### 5.1 General

Runoff amounts to the GGB are predicted to be small. The surface runoff water quality currently is slightly elevated in TDS and some metals, but this is expected to improve as reclamation efforts progress, and planned revegetation of the canyon area has been completed. Runoff water quality to date indicates that acid rock drainage will not be an issue because waters sampled are slightly alkaline.

The GGB is currently dry, and is predicted to be free-draining based on the geologic characteristics. No permanent ponding is predicted for the facility. Potential impacts to receiving waters are estimated to be de-minimus because exploratory drilling indicated no ground water occurrence to a 2050-foot depth beneath the facility.

### 5.2 Regulatory Issues

Surface water at Mercur is currently being addressed under other regulated programs which are currently in place. Stormwater runoff is currently subject to the Stormwater Pollution Prevention Plan for Mercur and to UPDES programs and provisions. These plans will continue for a currently undefined period of time after 1998.

Based upon discussions in the June 4, 1997 meeting, it is not necessary for the UDWQ to request Barrick to apply for a discharge permit under the State of Utah Ground Water Quality Protection (UAC R317-6). Section 6.2 of the regulations identifies facilities which are permitted by rule under the regulations and are not required to obtain a discharge permit. The list of facilities includes, among others:

- Flood control systems including detention basins, catch basins, and wetland treatment facilities used for collecting, or conveying storm water runoff, and;

- Natural ground water seeping or flowing into conventional mine workings which reenters the ground by natural gravity flow prior to pumping or transporting out of the mine without being used in any mining or metallurgical practice.

Based on the permit by rule section of the regulations, the use of the GGB for collection of storm water runoff and infiltration of natural waters is appropriate without the need for issuance of a discharge permit.

## 6.0 REFERENCES

JBR Consultants, June 26, 1996, Notice of Intent to Revise Mining Operations, Barrick Resources (USA), Inc. To Division of Oil, Gas and Mining



**TABLE 3-1**  
**MINE DRAINAGE**  
**RUNOFF CALCULATIONS**  
**MERCUR CANYON**  
**10 YEAR 24-HOUR STORM EVENT**

BASIN NAME	ACRES	CURVE NUMBER	2.61 INCH EVENT RUNOFF (IN)	2.61 INCH EVENT RUNOFF (FT)	CALCULATED TOTAL RUNOFF Q (FT3)	CALCULATED TOTAL RUNOFF Q (GALLONS)
A	231	65	0.4	0.03333	335,412	2,508,882
B	221	65	0.4	0.03333	320,892	2,400,272
C	209	65	0.4	0.03333	303,468	2,269,941
VFL#2 NORTH FACILITIES SUB BASIN	21	65	0.4	0.03333	30,492	228,080
UNDISTURBED	8	65	0.4	0.03333	11,616	86,888
DISTURBED	209	86	1.4	0.11667	1,062,138	7,944,792
NORTH FACILITIES SUB BASIN	27	65	0.4	0.03333	39,204	293,246
UPPER SHEEP CAMP						
UNDISTURBED	30	65	0.4	0.03333	43,560	325,829
DISTURBED	87	86	1.4	0.11667	442,134	3,307,162
LOWER SHEEP CAMP	91	86	1.4	0.11667	462,462	3,459,216
SAC PIT SUB BASIN	87	86	1.4	0.11667	442,134	3,307,162
GGG SOUTHEAST SUB BASIN	86	86	1.4	0.11667	437,052	3,269,149
GGG SOUTHWEST SUB BASIN	85	86	1.4	0.11667	431,970	3,231,136
GGG NORTH SUB BASIN						
UNDISTURBED	15	65	0.4	0.03333	21,780	162,914
DISTURBED	133	86	1.4	0.11667	675,906	5,055,777
PHOENIX/ROVER SUB BASIN						
UNDISTURBED	380	65	0.4	0.03333	551,760	4,127,165
DISTURBED	438	86	1.4	0.11667	2,225,916	16,649,852
NORTH CENTRAL CANYON						
UNDISTURBED	535	65	0.4	0.03333	776,820	5,810,614
DISTURBED	35	86	1.4	0.11667	177,870	1,330,468
MEADOW CANYON						
UNDISTURBED	918	65	0.4	0.03333	1,332,936	9,970,361
DISTURBED	35	86	1.4	0.11667	177,870	1,330,468
ANT HILL	24	86	1.4	0.11667	121,968	912,321
VFL#3	98	65	0.4	0.03333	142,296	1,064,374
LOWER TAILS DAM SUB BASIN	167	65	0.4	0.03333	242,484	1,813,780
<b>TOTAL VOLUME RUNOFF</b>					<b>10,810,140</b>	<b>80,859,847</b>

Note: Precipitation numbers based on coefficient correction factors applied to precipitation events, NOAA -2  
Atlas, Tooele Weather Station

**TABLE 3-2**  
**MINE DRAINAGE RUNOFF**  
**CALCULATIONS**  
**MERCUR CANYON**  
**100 YEAR 24-HOUR STORM EVENT**

BASIN NAME	ACRES	CURVE NUMBER	3.8 INCH EVENT RUNOFF (IN)	3.8 INCH EVENT RUNOFF (FT)	CALCULATED TOTAL RUNOFF Q (FT3)	CALCULATED TOTAL RUNOFF Q (GALLONS)
A	231	65	0.9	0.07500	754,677	5,644,984
B	221	65	0.9	0.07500	722,007	5,400,612
C	209	65	0.9	0.07500	682,803	5,107,366
VFL#2 NORTH FACILITIES SUB BASIN	21	65	0.9	0.07500	68,607	513,180
UNDISTURBED	8	65	0.9	0.07500	26,136	195,497
DISTURBED	209	86	2.35	0.19583	1,782,875	13,335,901
NORTH FACILITIES SUB BASIN	27	65	0.9	0.07500	88,209	659,803
UPPER SHEEP CAMP						
UNDISTURBED	30	65	0.9	0.07500	98,010	733,115
DISTURBED	87	86	2.35	0.19583	742,154	5,551,308
LOWER SHEEP CAMP	91	86	2.35	0.19583	776,276	5,806,541
SAC PIT SUB BASIN	87	86	2.35	0.19583	742,154	5,551,308
GGG SOUTHEAST SUB BASIN	86	86	2.35	0.19583	733,623	5,487,500
GGG SOUTHWEST SUB BASIN	85	86	2.35	0.19583	725,093	5,423,692
GGG NORTH SUB BASIN						
UNDISTURBED	15	65	0.9	0.07500	49,005	366,557
DISTURBED	133	86	2.35	0.19583	1,134,557	8,486,483
PHOENIX/ROVER SUB BASIN						
UNDISTURBED	380	65	0.9	0.07500	1,241,460	9,286,121
DISTURBED	438	86	2.35	0.19583	3,736,359	27,947,965
NORTH CENTRAL CANYON						
UNDISTURBED	535	65	0.9	0.07500	1,747,845	13,073,881
DISTURBED	35	86	2.35	0.19583	298,568	2,233,285
MEADOW CANYON						
UNDISTURBED	918	65	0.9	0.07500	2,999,106	22,433,313
DISTURBED	35	86	2.35	0.19583	298,568	2,233,285
ANT HILL	24	86	2.35	0.19583	204,732	1,531,395
VFL#3	98	86	0.9	0.07500	320,166	2,394,842
LOWER TAILS DAM SUB BASIN	167	86	0.9	0.07500	545,589	4,081,006
<b>TOTAL VOLUME RUNOFF</b>					<b>20,518,575</b>	<b>153,478,941</b>

Note: Precipitation numbers based on estimates provided by JBR for 24-hour, 100 year event, June 26, 1996

Table 3-3

BARRICK MERCUR GOLD MINE  
SEED MIX  
#17542

<u>SPECIES</u>	<u>PERCENT OF MIX</u>
Thickspike Wheatgrass	12
Bluebunch Wheatgrass	10
Smooth Bromegrass	10
Slender Wheatgrass	12
Lewis Blue Flax	6
Palmer Penstemon	5
Bachelor Buttons	7
W.Stem Rubber Rabbitbrush	4.5
Mountain Big Sagebrush	8.5
Cicer Milkvetch	7
Ladak Alfalfa	6
Bottlebrush SquirrelTail	2
Yellow Sweetclover	5
Chokecherry	5
	<hr/> 100.0%

**TABLE 3-4  
GOLDEN GATE BASIN  
MERCUR MINE RUNOFF CONCENTRATIONS**

Parameter	Golden Gate Runoff D&B Yard Ramp 2/19/97 Concentrations (mg/l)	Golden Gate Runoff SW Pit Ramp 3/10/97 Concentrations (mg/l)	Golden Gate Runoff Ramp East 3/17/97 Concentrations (mg/l)
Alkalinity (Total)	85	150	106
Ammonia as N	3.3	<0.2	<0.2
Arsenic	1.60	0.87	0.77
Bicarbonate	104	183	129
Boron	0.12	0.52	<0.05
Cadmium	<0.001	<0.001	<0.001
Calcium	86.9	136	159
Chloride	71	200	208
Chromium	<0.005	<0.02	<0.02
Copper	0.01	0.02	0.02
Free Cyanide	0.19	<0.01	<0.002
Total Cyanide	0.20	0.004	<0.002
Fluoride	1.3	0.4	0.4
Hardness	122	201	375
Iron	0.31	8.56	13.4
Lead	<0.005	0.019	0.007
Magnesium	2.9	9.1	11.2
Manganese	0.05	0.41	0.28
Mercury	0.0004	0.0048	0.0091
Nitrate plus Nitrite as N	6.4	<0.08	2.04
PH	8.10	7.40	7.80
Phosphorous	0.58	0.19	0.27
Selenium	0.006	0.006	<0.01
Sodium	72	136	137
Sulfate	185	150	188
TDS	648	752	824
Thallium	0.034	0.042	0.051

TABLE 4-1

GOLDEN GATE BASIN WATER SAMPLE ANALYTES

<u>Parameter</u>	<u>Units</u>	<u>Limit</u>	<u>Detection Methodology<sup>b</sup></u>	<u>Reference</u> See 1,2,3,4 (and 5 below)	<u>Maximum Holding Time</u>
Sodium	mg/l	1.0	ICP	6-200.7	6 months
Phosphate as PO <sub>4</sub> -P	mg/l	0.01	Colorimetric	2-4500E	28 days
Potassium	mg/l	1.0	AAS/ICP	1-258.1;6-200.7	6 months
Calcium	mg/l	1.0	AAS/ICP	1-215.1;6-200.7	6 months
Magnesium	mg/l	1.0	AAS/ICP	1-242.1;6-200.7	6 months
Chloride	mg/l	0.5	Titrimetric	1-325.3	6 months
Fluoride	mg/l	0.1	Colorimetric	1-340.2	28 days
Sulfate	mg/l	5	Turbidimetric/Gravimetric	1-375.4	28 days
Carbonate as CO <sub>3</sub> at pH 4.5	mg/l	1	Titrimetric/Calculated	1-310.1;2-2320B 2-404	24 hours
Carbonate Alkalinity as CaCO <sub>3</sub> at pH 8.3	mg/l	5	Titrimetric	4-D1067-92B; 1-310.1; 2-2320B	14 days
Bicarbonate Alkalinity as HCO <sub>3</sub> at pH 4.5	mg/l	5	Titrimetric	4-D1067-92B; 1-310.1; 2-2320B 1-130.2	14 days 48 hours
Hardness as CaCO <sub>3</sub> Hardness (non-carb) as CaCO <sub>3</sub>	mg/l	5	EDTA	1-130.2	48 hours
Hardness (T) as CaCO <sub>3</sub>	mg/l	5	Calculation	2-2340B	48 hours
Hydroxide as OH	mg/l	0	Calculation	2-2320B	48 hours
Nitrate as N	mg/l	0.1	Colorimetric	2-353.1	24 hours
Nitrite	mg/l	0.005	Colorimetric	1-354.1	48 hours
Total Cations	meq/l	0.1	Calculation	2-104C-	
Total Anions	meq/l	0.1	Calculation	2-104C-	
Difference	%	0.1	Calculation	2-104C-	



TABLE 4-1 (Continued Page 2)

<u>Parameter</u>	<u>Units</u>	<u>Limit</u>	<u>Detection Methodology<sup>b</sup></u>	<u>Reference</u> See 1,2,3,4 (and 5 below)	<u>Maximum Holding Time</u>
<u>Trace Metals (D and T)<sup>a</sup></u>					
Aluminum	mg/l	0.1	AAS/ICP	1-202.1; 6-200.7	6 months
Ammonia as NH <sup>3</sup> -N	mg/l	0.2	Electrode	1-350.3; 2-4500F	28 days
Arsenic	mg/l	0.01	ICP	6-200.7	6 months
Barium	mg/l	0.01	ICP	6-200.7	6 months
Boron	mg/l	0.05	Colorimetric/ICP	2-404-A; 6-200.7	6 months
Cadmium	mg/l	0.002	ICP	6-200.7	6 months
Chromium	mg/l	0.01	ICP	6-200.7	6 months
Chromium, hexavalent	mg/l	0.01	Colorimetric	1-218.4; 7-307B	24 hours
Copper	mg/l	0.01	ICP	1-200.7	6 months
Cyanide (Free)	mg/l	0.002	Colorimetric	4-D-2036	14 days
Cyanide (Amenable)	mg/l	0.002	Colorimetric	4-D-2036	14 days
Cyanide (Total)	mg/l	0.002	Colorimetric	4-D-2036	14 days
Cyanide (Weak Acid Dissociable)	mg/l	0.002	Colorimetric	4-D2036	14 days
Gold	mg/l	0.01	AAS/ICP	1-231.1; 6-200.7	6 months
Iron	mg/l	0.01	AAS/ICP	1-236.1; 6-200.7	6 months
Lead	mg/l	0.005	ICP/GFAA/ICP	6-200.9; 6-200.7	6 months
Manganese	mg/l	0.01	AAS/ICP	1-243.1; 6-200.7	6 months
Mercury	mg/l	0.0002	Cold Vapor/AAS	6-245.1; 3-7470	6 months
Magnesium	mg/l	0.1	AAS/ICP	1-242.1; 6-200.7	6 months
Nickel	mg/l	0.01	ICP	6-200.7	6 months
Selenium	mg/l	0.002	ICP	6-200.7; 6-200.8; 6-200.9	28 days
Silica as SiO <sub>2</sub>	mg/l	0.1	ICP	6-200.7	6 months
Silver	mg/l	0.01	AAS/ICP	1-272.1; 6-200.7	6 months
Thallium	mg/l	0.002	ICP/MS	6-200.8	6 months
Zinc	mg/l	0.01	AAS/ICP	1-289.1; 6-200.7	6 months



TABLE 4-1 (Continued Page 3)

<u>Parameter</u>	<u>Units</u>	<u>Limit</u>	<u>Detection Methodology<sup>b</sup></u>	<u>Reference</u> See 1,2,3,4 (and 5 below)	<u>Maximum Holding Time</u>
<u>Other Parameters</u>					
pH(Field)	units	0.01	Electrometric	1-150.1; 1-150.2	Immediate
Specific Conductance at 25°C (Field)	umhos/cm	1	Conductance	1-120.1;2-205; 4-D-1125-91A	28 days
Total Dissolved Solids	mg/l	10	Gravimetric,	1-160.1;2-209B 180°C	7 days
Total Suspended Solids	mg/l	2	Gravimetric,	1-160.2 105°C	7 days
Turbidity	ntu units	0.1	Turbidimeter	1-180.1	24 hours
Temperature (Field)	degrees	0.5	Thermometric	2-3111B	Immediate

References

- (1) "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, EMSL, Cincinnati, March 1983
- (2) "Standard Methods for the Examination of Water and Wastewater," 16th Edition, APHA, 1985.
- (3) "Test Methods for Evaluating Solid Waste," EPA Publication SW-846, 3rd Edition.
- (4) "Annual Book of ASTM Standards, 1994, Vols. 11.01 and 11.02, American Society for Testing and Materials.
- (5) "Standard Methods for the Examination of Water and Wastewater," 18th Edition, American Public Health Association, 1992.
- (6) "Methods for the Determination of Metals in Environmental Samples-Supplement I", EPA-600/R-94-111, May 1994.
- (7) "Standard Methods for the Examination of Water and Wastewater," 17th Edition, APHA, 1987.

Notes

Detection limits are limits which are the best achievable with the listed analytical method. Interferences in specific samples may result in a higher detection limit. Detection limits of 0.002 for the cyanides can be achieved by adjusting the sample volume and cell size of the spectrophotometer. A detection limit of 0.01 for nickel can be achieved by concentrating the samples. These methodologies have been approved by EPA.

**a** All metals from water samples will be analyzed for dissolved (D) metals (0.45u filtered) except Mercury which will be for total (T) metals (unfiltered, preparation method 3010 and 3020).

**b** Either of the EPA accepted methods shown may be used for analysis

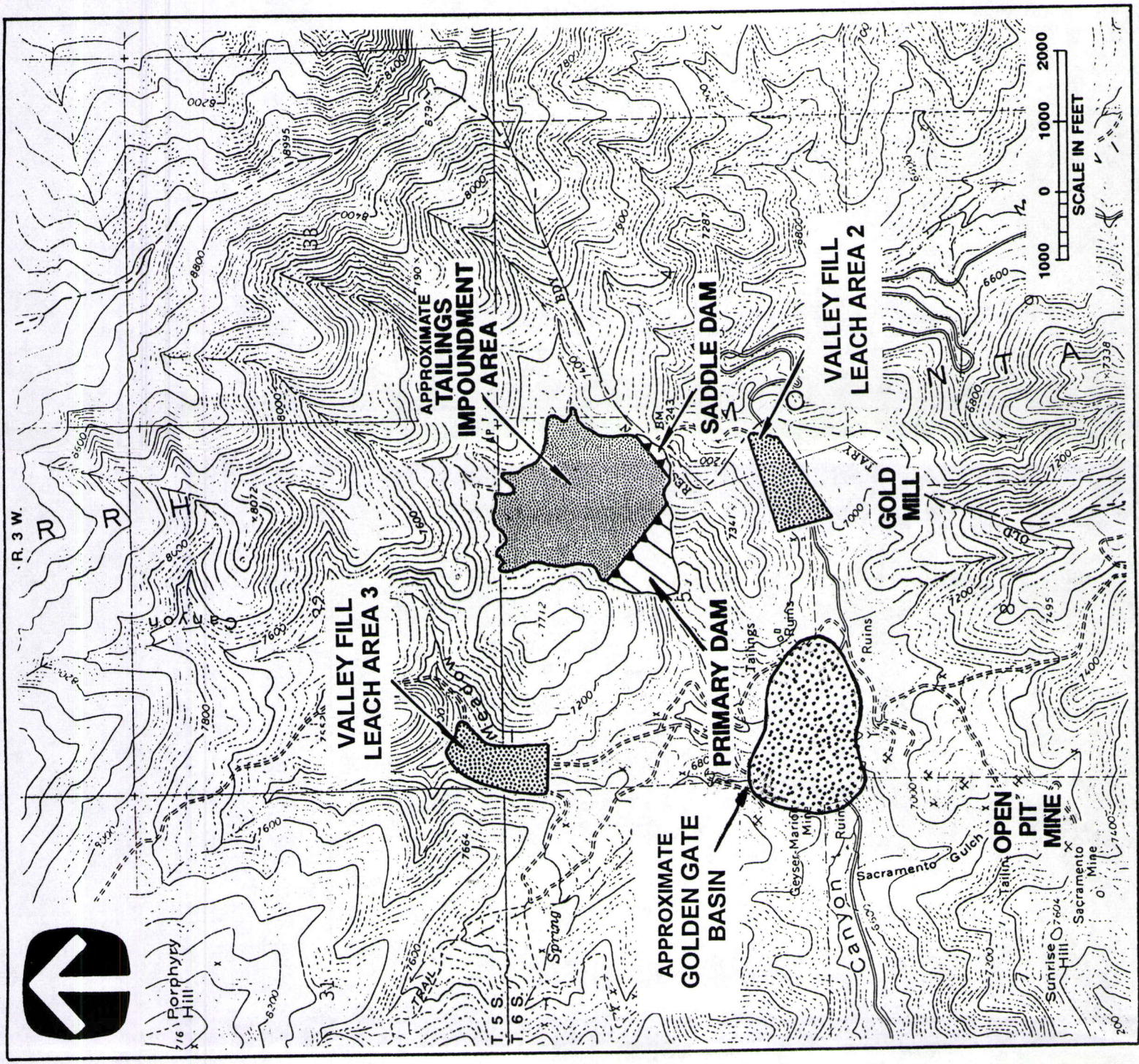
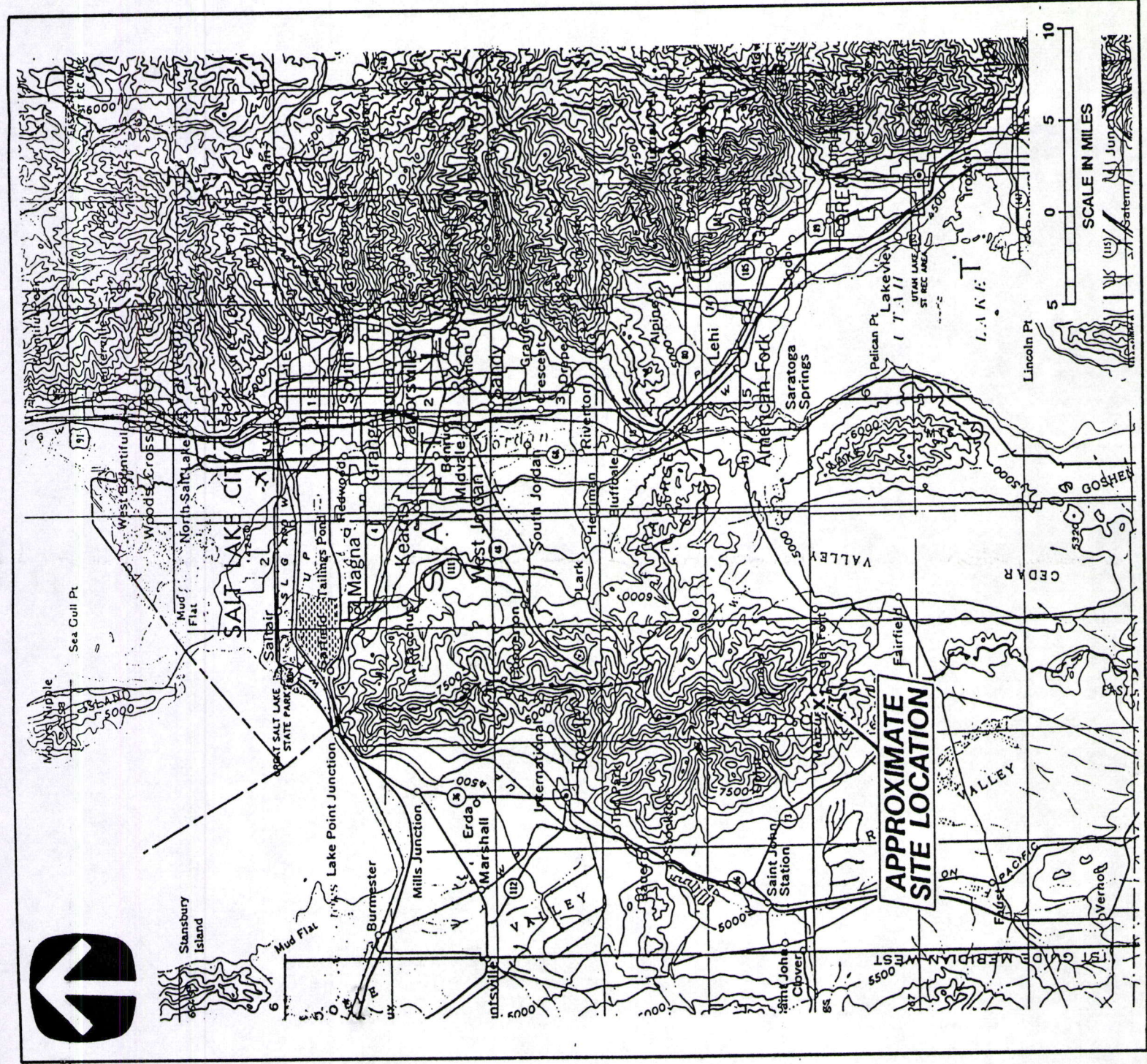
ICP indicates Inductively-coupled plasma methods

MS indicates Mass Spectrometry

AAS indicates Atomic Adsorption Spectroscopy

EDTA is Ethylenediamine Tetraacetate used in titrations







**APPENDIX A**

**WATER QUALITY ANALYTICAL REPORTS**





Date: 3/12/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 13670  
Lab #: 97-U001861  
Project: GOLDEN GATE RUNOFF  
Sample Desc: Runoff A  
D & B Yard Ramp

Date Sampled: 2/19/97  
Date Submitted: 2/20/97

Time Sampled: 14:00  
Time Received: 11:45

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Bicarbonate as HCO <sub>3</sub> , mg/L	104	1	3/ 4/97 10:10	SM 2320B	AJP
Carbonate as CO <sub>3</sub> , mg/L	< 1	1	3/ 4/97 10:10	SM 2320B	AJP
Hydroxide as OH, mg/L	< 1	1	3/ 4/97 10:10	SM 2320B	AJP
Alkalinity, Total, mg/L	85	1	3/ 4/97 10:10	SM 2320B	AJP
Ammonia-Nitrogen, mg/L	3.3	0.2	3/ 5/97 9:00	SM 4500G/F	TH
Chloride (D), mg/L	71	1	2/25/97 11:22	EPA 325.3	AJP
Chromium, Hexavalent, mg/L	< 0.02	0.02	2/20/97 7:00	SM18,3500D	TH
Conductance, Specific, umhos/cm	893	0.1	2/26/97 10:00	EPA 120.1	KRF
Cyanide, Amenable to Cl <sub>2</sub> , mg/L	0.195	0.005	3/ 4/97 8:00	ASTM D2036	TH
Cyanide, Free, mg/L	0.19	0.05	3/ 4/97 11:30	ASTM D2036	TH
Cyanide (T), mg/L	0.20	0.01	3/ 4/97 8:00	ASTM D2036	TH
Cyanide, WAD, mg/L	0.043	0.007	3/ 4/97 8:00	ASTM D2036	TH
Fluoride, mg/L	1.3	0.25	2/26/97 16:00	EPA 340.2	EG
Hardness, EDTA Titration, mg/L	226	17	3/ 7/97 11:37	EPA 130.2	AJP
Hardness Index: Hard Water					
Hardness, (n-carb), mg/L	122	5		CAL	
Hardness, (calc), mg/L	229	5		CAL	
Mercury (T), as Hg, mg/L	0.0004	0.0002	3/ 4/97 14:00	EPA 245.1	BJP
Mercury, as Hg (D), mg/L	< 0.0002	0.0002	3/ 4/97 14:00	EPA 245.1	BJP
Nitrate, Nitrogen, mg/L	6.1	0.8	2/27/97 12:06	EPA 353.1	TH

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 3/12/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 13670  
Lab #: 97-U001861  
Project: GOLDEN GATE RUNOFF  
Sample Desc: Runoff A  
D & B Yard Ramp

Date Sampled: 2/19/97  
Date Submitted: 2/20/97

Time Sampled: 14:00  
Time Received: 11:45

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Nitrite, Nitrogen, mg/L	0.26	0.012	2/20/97 15:45	EPA 354.1	BJP
Nitrate/Nitrite-Nitrogen, mg/L	6.4	0.8	2/27/97 12:06	EPA 353.1	TH
pH, units	8.10	0.05	2/20/97 11:00	EPA 150.1	LS
Phosphorus, Total, mg/L	0.58	0.02	2/24/97 13:00	SM 4500-P	BJP
Sulfate, mg/L	185	50	3/ 2/97 10:00	EPA 375.4	TH
Total Dissolved Solids, mg/L	648	10	2/24/97 1:45	EPA 160.1	LS
Total Suspended Solids, mg/L	4,080	2.5	2/20/97 13:25	EPA 160.2	LS
Turbidity, NTU	4,110	50	2/20/97 13:10	EPA 180.1	LS
Aluminum (T), as Al, mg/L	0.21	0.05	2/25/97 11:08	EPA 200.7	LH
Aluminum (D), as Al, mg/L	0.05	0.05	2/21/97 10:01	EPA 200.7	LH
Arsenic (T), as As, mg/L	1.60	0.06	2/26/97 9:50	EPA 200.7	LH
Arsenic (D), as As, mg/L	1.60	0.06	2/26/97 10:55	EPA 200.7	LH
Barium (T), as Ba, mg/L	0.08	0.01	2/25/97 11:08	EPA 200.7	LH
Barium (D), as Ba, mg/L	0.06	0.01	2/21/97 10:01	EPA 200.7	LH
Boron (T), as B, mg/L	0.12	0.05	2/25/97 11:08	EPA 200.7	LH
Calcium (T), as Ca, mg/L	86.9	0.1	2/25/97 11:08	EPA 200.7	LH
Chromium (T), as Cr, mg/L	< 0.005	0.005	2/25/97 11:08	EPA 200.7	LH
Chromium (D), as Cr, mg/L	< 0.005	0.005	2/21/97 10:01	EPA 200.7	LH
Copper (T), as Cu, mg/L	0.01	0.01	2/25/97 11:08	EPA 200.7	LH
Copper (D), as Cu, mg/L	< 0.01	0.01	2/21/97 10:01	EPA 200.7	LH

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 3/12/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 13670  
Lab #: 97-U001861  
Project: GOLDEN GATE RUNOFF  
Sample Desc: Runoff A  
D & B Yard Ramp

Date Sampled: 2/19/97  
Date Submitted: 2/20/97

Time Sampled: 14:00  
Time Received: 11:45

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Gold (T), as Au, mg/L	< 0.02	0.02	2/25/97 11:08	EPA 200.7	LH
Gold (D), as Au, mg/L	< 0.02	0.02	2/21/97 10:01	EPA 200.7	LH
Iron (T), as Fe, mg/L	0.31	0.02	2/25/97 11:08	EPA 200.7	LH
Iron (D), as Fe, mg/L	0.06	0.02	2/21/97 10:01	EPA 200.7	LH
Magnesium (T), as Mg, mg/L	2.9	0.1	2/25/97 11:08	EPA 200.7	LH
Magnesium (D), as Mg, mg/L	2.9	0.1	2/21/97 10:01	EPA 200.7	LH
Manganese (T), as Mn, mg/L	0.05	0.01	2/25/97 11:08	EPA 200.7	LH
Manganese (D), as Mn, mg/L	0.05	0.01	2/21/97 10:01	EPA 200.7	LH
Nickel (T), as Ni, mg/L	< 0.01	0.01	2/25/97 11:08	EPA 200.7	LH
Nickel (D), as Ni, mg/L	< 0.01	0.01	2/21/97 10:01	EPA 200.7	LH
Potassium (T), as K, mg/L	7	2	2/25/97 11:08	EPA 200.7	LH
Silicon Dioxide, mg/L	4.3	0.2	2/26/97 9:16	EPA 200.7	LH
Silver (T), as Ag, mg/L	< 0.005	0.005	2/25/97 11:08	EPA 200.7	LH
Silver (D), as Ag, mg/L	< 0.005	0.005	2/21/97 10:01	EPA 200.7	LH
Sodium (T), as Na, mg/L	72.0	0.1	2/25/97 11:08	EPA 200.7	LH
Zinc (T), as Zn, mg/L	0.01	0.01	2/25/97 11:08	EPA 200.7	LH
Zinc (D), as Zn, mg/L	< 0.01	0.01	2/21/97 10:01	EPA 200.7	LH
Cadmium (T), as Cd, mg/L	< 0.001	0.001	2/24/97 15:33	EPA 200.9	EG
Cadmium, (D) as Cd, mg/L	< 0.001	0.001	2/24/97 15:33	EPA 200.9	EG
Lead (T), as Pb, mg/L	< 0.005	0.005	2/26/97 9:52	EPA 200.9	EG

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 3/12/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 13670  
Lab #: 97-U001861  
Project: GOLDEN GATE RUNOFF  
Sample Desc: Runoff A  
D & B Yard Ramp

Date Sampled: 2/19/97  
Date Submitted: 2/20/97

Time Sampled: 14:00  
Time Received: 11:45

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Lead, (D) as Pb, mg/L	< 0.005	0.005	2/26/97 9:52	EPA 200.9	EG
Selenium (T), as Se, mg/L	0.006	0.002	2/27/97 15:58	EPA 200.9	EG
Selenium, (D) as Se, mg/L	0.006	0.002	2/27/97 15:58	EPA 200.9	EG
Thallium (T), as Tl, mg/L	0.034	0.001	2/24/97 11:44	EPA 200.9	EG
Thallium, (D) as Tl, mg/L	0.039	0.001	2/24/97 11:44	EPA 200.9	EG
Cation, meq/L	7.90				
Anion, meq/L	7.74				
% Difference,	-1.00				
Receiving Temperature, C	-0.3		2/20/97 11:45		RCG

NOTE: Sample submitted on ice.  
Thallium values Total and Dissolved have been  
verified by reanalysis.

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 3/27/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 14005  
Lab #: 97-U002471  
Sample Desc: Gold Gate Runoff #2  
SW Pit Ramp

Date Sampled: 3/10/97  
Date Submitted: 3/10/97

Time Sampled: 7:00  
Time Received: 11:50

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Bicarbonate as HCO <sub>3</sub> , mg/L	183	1	3/19/97 8:30	SM 2320B	TM
Carbonate as CO <sub>3</sub> , mg/L	< 1	1	3/19/97 8:30	SM 2320B	TM
Hydroxide as OH, mg/L	< 1	1	3/19/97 8:30	SM 2320B	TM
Alkalinity, Total, mg/L	150	1	3/19/97 8:30	SM 2320B	TM
Ammonia-Nitrogen, mg/L	< 0.2	0.2	3/20/97 8:50	SM 4500G/F	TH
Chloride (D), mg/L	200	2.5	3/14/97 15:45	EPA 325.3	AJP
Chromium, Hexavalent, mg/L	< 0.02	0.02	3/10/97 15:43	SM18,3500D	AJP
Conductance, Specific, umhos/cm	1,180	0.1	3/13/97 10:00	EPA 120.1	KRF
Cyanide, Amenable to Cl <sub>2</sub> , mg/L	0.004	0.003	3/20/97 10:02	ASTM D2036	TH
Cyanide, Free, mg/L	< 0.01	0.01	3/20/97 10:00	ASTM D2036	TH
Cyanide (T), mg/L	0.004	0.002	3/19/97 9:25	ASTM D2036	TH
Cyanide, WAD, mg/L	< 0.003	0.003	3/20/97 10:02	ASTM D2036	TH
Fluoride, mg/L	0.4	0.25	3/12/97 13:00	EPA 340.2	EG
Hardness, EDTA Titration, mg/L	384	17	3/17/97 9:00	EPA 130.2	TM
Hardness Index: Hard Water					
Hardness, (n-carb), mg/L	201	17		CAL	
Hardness, (calc), mg/L	337	17		CAL	
Mercury (T), as Hg, mg/L	0.0048	0.0002	3/18/97 14:00	EPA 245.1	BJP
Mercury, as Hg (D), mg/L	< 0.0002	0.0002	3/18/97 14:00	EPA 245.1	BJP
Nitrate, Nitrogen, mg/L	< 0.08	0.08	3/14/97 10:14	EPA 353.1	TH
Nitrite, Nitrogen, mg/L	< 0.005	0.005	3/11/97 16:20	EPA 354.1	BJP

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX





Date: 3/27/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 14005  
Lab #: 97-U002471  
Sample Desc: Gold Gate Runoff #2  
SW Pit Ramp

Date Sampled: 3/10/97  
Date Submitted: 3/10/97

Time Sampled: 7:00  
Time Received: 11:50

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Nitrate/Nitrite-Nitrogen, mg/L	< 0.08	0.08	3/14/97 10:14	EPA 353.1	TH
pH, units	7.40	0.05	3/10/97 13:40	EPA 150.1	LS
Phosphorus, Total, mg/L	0.19	0.01	3/18/97 15:00	SM 4500-P	BJP
Sulfate, mg/L	150	25	3/18/97 9:00	EPA 375.4	TM
Total Dissolved Solids, mg/L	752	10	3/11/97 13:00	EPA 160.1	LS
Total Suspended Solids, mg/L	261	2.5	3/10/97 13:45	EPA 160.2	LS
Turbidity, NTU	227	0.5	3/10/97 13:30	EPA 180.1	LS
Aluminum (T), as Al, mg/L	3.61	0.05	3/14/97 11:09	EPA 200.7	LH
Aluminum (D), as Al, mg/L	< 0.05	0.05	3/14/97 11:09	EPA 200.7	LH
Arsenic (T), as As, mg/L	0.87	0.06	3/14/97 11:09	EPA 200.7	LH
Arsenic (D), as As, mg/L	0.20	0.06	3/14/97 11:09	EPA 200.7	LH
Barium (T), as Ba, mg/L	0.49	0.01	3/14/97 11:09	EPA 200.7	LH
Barium (D), as Ba, mg/L	0.06	0.01	3/14/97 11:09	EPA 200.7	LH
Boron (T), as B, mg/L	0.52	0.05	3/14/97 11:09	EPA 200.7	LH
Calcium (T), as Ca, mg/L	136	0.1	3/14/97 11:09	EPA 200.7	LH
Chromium (T), as Cr, mg/L	0.011	0.005	3/14/97 11:09	EPA 200.7	LH
Chromium (D), as Cr, mg/L	< 0.005	0.005	3/14/97 11:09	EPA 200.7	LH
Copper (T), as Cu, mg/L	0.02	0.01	3/14/97 11:09	EPA 200.7	LH
Copper (D), as Cu, mg/L	< 0.01	0.01	3/14/97 11:09	EPA 200.7	LH
Gold (T), as Au, mg/L	< 0.02	0.02	3/14/97 11:09	EPA 200.7	LH
Gold (D), as Au, mg/L	< 0.02	0.02	3/14/97 11:09	EPA 200.7	LH

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 3/27/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 14005  
Lab #: 97-U002471  
Sample Desc: Gold Gate Runoff #2  
SW Pit Ramp

Date Sampled: 3/10/97  
Date Submitted: 3/10/97

Time Sampled: 7:00  
Time Received: 11:50

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Iron (T), as Fe, mg/L	8.56	0.02	3/14/97 11:09	EPA 200.7	LH
Iron (D), as Fe, mg/L	< 0.02	0.02	3/14/97 11:09	EPA 200.7	LH
Magnesium (T), as Mg, mg/L	9.1	0.1	3/14/97 11:09	EPA 200.7	LH
Magnesium (D), as Mg, mg/L	7.4	0.1	3/14/97 11:09	EPA 200.7	LH
Manganese (T), as Mn, mg/L	0.41	0.01	3/14/97 11:09	EPA 200.7	LH
Manganese (D), as Mn, mg/L	0.28	0.01	3/14/97 11:09	EPA 200.7	LH
Nickel (T), as Ni, mg/L	0.02	0.01	3/14/97 11:09	EPA 200.7	LH
Nickel (D), as Ni, mg/L	< 0.01	0.01	3/14/97 11:09	EPA 200.7	LH
Potassium (T), as K, mg/L	6	2	3/14/97 11:09	EPA 200.7	LH
Silicon Dioxide, mg/L	17.4	0.2	3/14/97 11:09	EPA 200.7	LH
Silver (T), as Ag, mg/L	< 0.005	0.005	3/14/97 11:09	EPA 200.7	LH
Silver (D), as Ag, mg/L	< 0.005	0.005	3/14/97 11:09	EPA 200.7	LH
Sodium (T), as Na, mg/L	136	0.1	3/14/97 11:09	EPA 200.7	LH
Zinc (T), as Zn, mg/L	0.31	0.01	3/14/97 11:09	EPA 200.7	LH
Zinc (D), as Zn, mg/L	0.10	0.01	3/14/97 11:09	EPA 200.7	LH
Cadmium (T), as Cd, mg/L	< 0.001	0.001	3/14/97 16:15	EPA 200.9	EG
Cadmium, (D) as Cd, mg/L	< 0.001	0.001	3/14/97 16:15	EPA 200.9	EG
Lead (T), as Pb, mg/L	0.019	0.005	3/15/97 9:24	EPA 200.9	EG
Lead, (D) as Pb, mg/L	< 0.005	0.005	3/15/97 9:24	EPA 200.9	EG
Selenium (T), as Se, mg/L	0.006	0.002	3/22/97 10:58	EPA 200.9	EG
Selenium, (D) as Se, mg/L	< 0.002	0.002	3/22/97 10:58	EPA 200.9	EG

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 3/27/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 14005  
Lab #: 97-U002471  
Sample Desc: Gold Gate Runoff #2  
SW Pit Ramp

Date Sampled: 3/10/97  
Date Submitted: 3/10/97

Time Sampled: 7:00  
Time Received: 11:50

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Thallium (T), as Tl, mg/L	0.042	0.001	3/21/97 16:29	EPA 200.9	EG
Thallium, (D) as Tl, mg/L	0.013	0.001	3/21/97 16:29	EPA 200.9	EG
Cation, meq/L	13.4				
Anion, meq/L	11.8				
% Difference,	-6.60				
Receiving Temperature, C	3.3		3/10/97 11:50		RCG

NOTE: Sample submitted on ice.

Significant soil material present in metals sample  
contributing to a high cation/anion difference.

Approved By: 

{generic.rpt}

6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 4/10/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 14157  
Lab #: 97-U002857  
Project: MARCH MONTHLY WATER SAMPLE  
Sample Desc: Runoff B  
Golden Gate Pit Ramp East

Date Sampled: 3/17/97  
Date Submitted: 3/18/97

Time Sampled: 14:00  
Time Received: 9:30

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Bicarbonate as HCO <sub>3</sub> , mg/L	129	1	3/19/97 8:30	SM 2320B	TM
Carbonate as CO <sub>3</sub> , mg/L	< 1	1	3/19/97 8:30	SM 2320B	TM
Hydroxide as OH, mg/L	< 1	1	3/19/97 8:30	SM 2320B	TM
Alkalinity, Total, mg/L	106	1	3/19/97 8:30	SM 2320B	TM
Ammonia-Nitrogen, mg/L	< 0.2	0.2	3/26/97 10:17	SM 4500G/F	TH
Chloride (D), mg/L	208	2.5	3/20/97 10:00	EPA 325.3	TM
Chromium, Hexavalent, mg/L	< 0.02	0.02	3/18/97 10:00	SM18,3500D	TM
Conductance, Specific, umhos/cm	1,240	0.1	3/20/97 10:00	EPA 120.1	KRF
Cyanide, Amenable to Cl <sub>2</sub> , mg/L	< 0.002	0.002	3/25/97 9:00	ASTM D2036	TH
Cyanide, Free, mg/L	< 0.002	0.002	3/25/97 9:00	ASTM D2036	TH
Cyanide (T), mg/L	< 0.002	0.002	3/25/97 9:00	ASTM D2036	TH
Cyanide, WAD, mg/L	< 0.002	0.002	3/25/97 9:00	ASTM D2036	TH
Fluoride, mg/L	0.4	0.1	4/ 7/97 16:00	EPA 340.2	EG
Hardness, EDTA Titration, mg/L	504	50	3/20/97 9:00	EPA 130.2	TM
Hardness Index: Hard Water					
Hardness, (n-carb), mg/L	375	50		CAL	
Hardness, (calc), mg/L	443	50		CAL	
Mercury (T), as Hg, mg/L	0.0091	0.0002	3/28/97 14:30	EPA 245.1	BJP
Mercury, as Hg (D), mg/L	< 0.0002	0.0002	3/28/97 14:30	EPA 245.1	BJP
Nitrate, Nitrogen, mg/L	2.02	0.08	3/24/97 14:17	EPA 353.1	TH

Approved By: \_\_\_\_\_

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6100 SOUTH STRATLER  
SALT LAKE CITY UTAH 84107 6905  
801 262 7299 PHONE  
801 262 7378 FAX



Date: 4/10/97

To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 14157  
Lab #: 97-U002857  
Project: MARCH MONTHLY WATER SAMPLE  
Sample Desc: Runoff B  
Golden Gate Pit Ramp East

Date Sampled: 3/17/97  
Date Submitted: 3/18/97

Time Sampled: 14:00  
Time Received: 9:30

## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Nitrite, Nitrogen, mg/L	0.027	0.005	3/18/97 17:00	EPA 354.1	BJP
Nitrate/Nitrite-Nitrogen, mg/L	2.04	0.08	3/24/97 14:17	EPA 353.1	TH
pH, units	7.80	0.05	3/20/97 14:00	EPA 150.1	LS
Phosphorus, Total, mg/L	0.27	0.01	3/26/97 12:30	SM 4500-P	BJP
Sulfate, mg/L	188	33	3/21/97 13:00	EPA 375.4	TM
Total Dissolved Solids, mg/L	824	10	3/21/97 14:00	EPA 160.1	LS
Total Suspended Solids, mg/L	165	2.5	3/20/97 14:15	EPA 160.2	LS
Turbidity, NTU	325	0.5	3/20/97 13:30	EPA 180.1	LS
Aluminum (T), as Al, mg/L	6.88	0.05	3/24/97 10:22	EPA 200.7	LH
Aluminum (D), as Al, mg/L	< 0.05	0.05	3/24/97 10:22	EPA 200.7	LH
Barium (T), as Ba, mg/L	0.29	0.01	3/24/97 10:22	EPA 200.7	LH
Barium (D), as Ba, mg/L	0.05	0.01	3/24/97 10:22	EPA 200.7	LH
Boron (T), as B, mg/L	< 0.05	0.05	3/24/97 10:22	EPA 200.7	LH
Calcium (T), as Ca, mg/L	159	0.1	3/24/97 10:22	EPA 200.7	LH
Chromium(T), as Cr, mg/L	0.013	0.005	3/24/97 10:22	EPA 200.7	LH
Chromium (D), as Cr, mg/L	< 0.005	0.005	3/24/97 10:22	EPA 200.7	LH
Copper (T), as Cu, mg/L	0.02	0.01	3/24/97 10:22	EPA 200.7	LH
Copper (D), as Cu, mg/L	< 0.01	0.01	3/24/97 10:22	EPA 200.7	LH
Gold (T), as Au, mg/L	< 0.02	0.02	3/24/97 10:22	EPA 200.7	LH
Gold (D), as Au, mg/L	< 0.02	0.02	3/24/97 10:22	EPA 200.7	LH

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To: Barrick Mercur Gold Mine  
attn. Dave Beatty  
P.O. Box 838  
Tooele, UT 84074-4447

Group #: 14157  
Lab #: 97-U002857  
Project: MARCH MONTHLY WATER SAMPLE  
Sample Desc: Runoff B  
Golden Gate Pit Ramp East

Date Sampled: 3/17/97  
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INORGANIC PARAMETERS					
Iron (T), as Fe, mg/L	13.4	0.02	3/24/97 10:22	EPA 200.7	LH
Iron (D), as Fe, mg/L	< 0.02	0.02	3/24/97 10:22	EPA 200.7	LH
Magnesium (T), as Mg, mg/L	11.2	0.1	3/24/97 10:22	EPA 200.7	LH
Magnesium (D), as Mg, mg/L	8.4	0.1	3/24/97 10:22	EPA 200.7	LH
Manganese (T), as Mn, mg/L	0.28	0.01	3/24/97 10:22	EPA 200.7	LH
Manganese (D), as Mn, mg/L	0.04	0.01	3/24/97 10:22	EPA 200.7	LH
Nickel (T), as Ni, mg/L	0.03	0.01	3/24/97 10:22	EPA 200.7	LH
Nickel (D), as Ni, mg/L	< 0.01	0.01	3/24/97 10:22	EPA 200.7	LH
Potassium (T), as K, mg/L	4	2	3/24/97 10:22	EPA 200.7	LH
Silicon Dioxide, mg/L	34.6	0.2	3/24/97 10:22	EPA 200.7	LH
Silver (T), as Ag, mg/L	< 0.005	0.005	3/24/97 10:22	EPA 200.7	LH
Silver (D), as Ag, mg/L	< 0.005	0.005	3/24/97 10:22	EPA 200.7	LH
Sodium (T), as Na, mg/L	137	0.1	3/24/97 10:22	EPA 200.7	LH
Zinc (T), as Zn, mg/L	0.12	0.01	3/24/97 10:22	EPA 200.7	LH
Zinc (D), as Zn, mg/L	0.04	0.01	3/24/97 10:22	EPA 200.7	LH
Arsenic (T), as As, mg/L	0.77	0.05	3/21/97 8:29	EPA 200.9	EG
Arsenic, (D) as As, mg/L	0.06	0.05	3/21/97 8:29	EPA 200.9	EG
Cadmium (T), as Cd, mg/L	< 0.001	0.001	3/24/97 12:43	EPA 200.9	EG
Cadmium, (D) as Cd, mg/L	< 0.001	0.001	3/24/97 12:43	EPA 200.9	EG
Lead (T), as Pb, mg/L	0.007	0.005	3/25/97 13:24	EPA 200.9	EG

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## CERTIFICATE OF ANALYSIS

PARAMETER	RESULT	MDL	DATE ANALYZED	METHOD	ANALYST
INORGANIC PARAMETERS					
Lead, (D) as Pb, mg/L	< 0.005	0.005	3/25/97 13:24	EPA 200.9	EG
Selenium (T), as Se, mg/L	< 0.01	0.01	3/26/97 9:11	EPA 200.9	EG
Selenium, (D) as Se, mg/L	< 0.01	0.01	3/26/97 9:11	EPA 200.9	EG
Thallium (T), as Tl, mg/L	0.051	0.001	3/28/97 10:14	EPA 200.9	EG
Thallium, (D) as Tl, mg/L	0.006	0.001	3/28/97 10:14	EPA 200.9	EG
Cation, meq/L	14.7				
Anion, meq/L	12.0				
% Difference,	-10.3				
Receiving Temperature, C	1.8		3/18/97 9:30		RCG

NOTE: Sample submitted on ice.

A significant amount of sediment was included with the metals sample. This elevated the sum of cations and produced a higher than normally acceptable cation/anion difference.

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